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United States Patent [19]

Wilkinson et al.

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[45] **Date of Patent: Jul. 7, 1998**

[54] **SPRING AIR GUN WITH INTERLOCKING MECHANISM**

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[73] Assignee: **Crosman Corporation**, East Bloomfield, N.Y.

[21] Appl. No.: **798,043**

[22] Filed: **Feb. 10, 1997**

[51] **Int. Cl.**[6] **F41B 11/14**

[52] **U.S. Cl.** **124/67**

[58] **Field of Search** 124/66, 67

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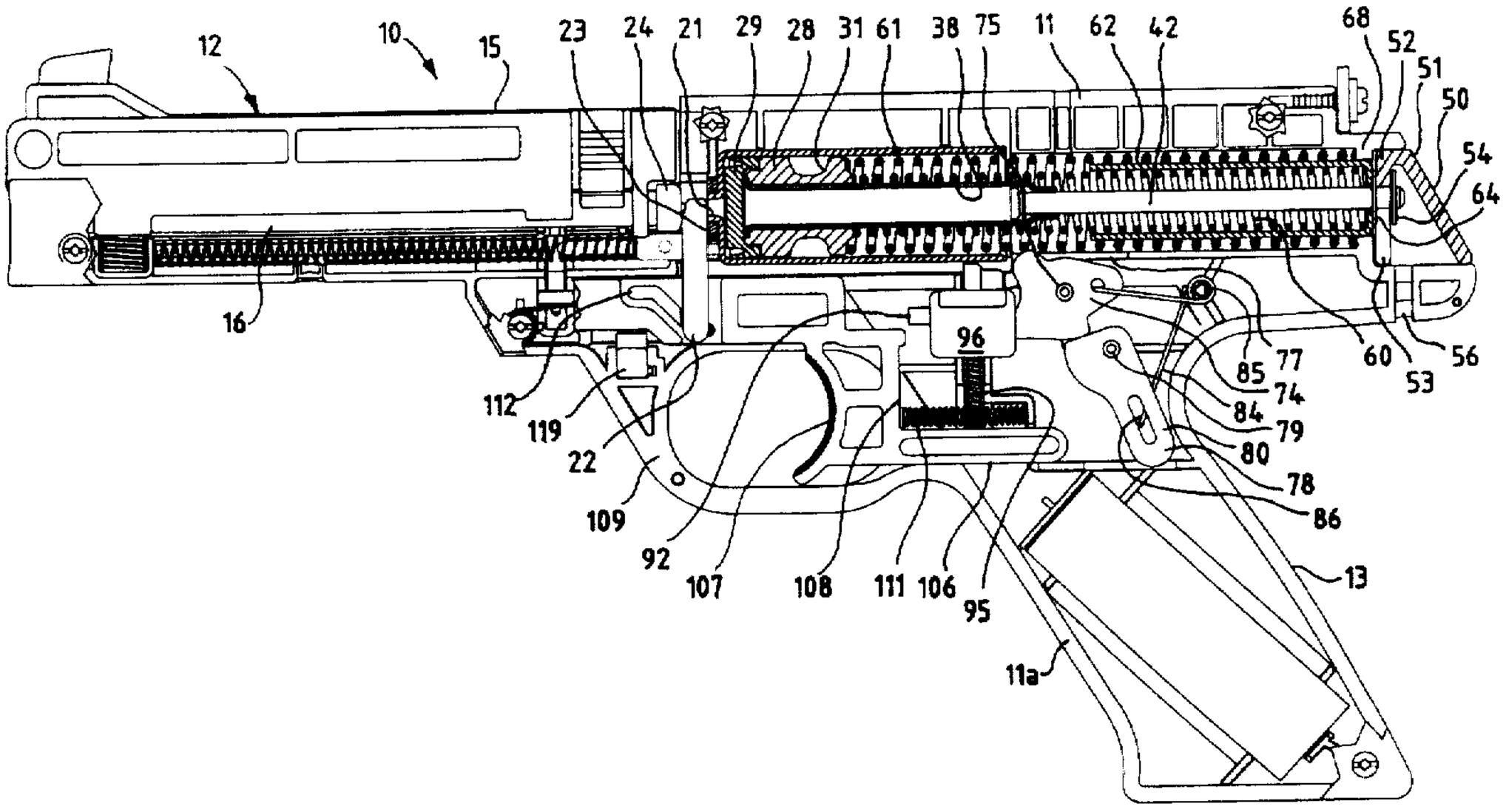
Primary Examiner—John A. Ricci

[57] **ABSTRACT**

A spring air gun includes a reciprocable piston and a slide for cocking the piston. The slide is movable between forward and rearward positions. A piston rod is connected to the slide and is slidably mounted within a piston tube which is connected to the piston. A pair of springs are concentrically mounted on the piston tube, and the forward end of each spring engages the piston. The rearward end of the inner spring engages the slide, and the rearward end of the outer spring engages the frame of the gun. A detent maintains the slide in the forward position, and a sear maintains the piston in the cocked position and is engageable with the detent for preventing the slide from moving rearwardly until the gun is fired. The gun is fired by pulling a trigger, which releases the sear from the piston. The detent can then be moved to allow the slide to be moved rearwardly to cock the piston. When the slide is not in the forward position, the detent prevents the trigger from being pulled.

23 Claims, 14 Drawing Sheets



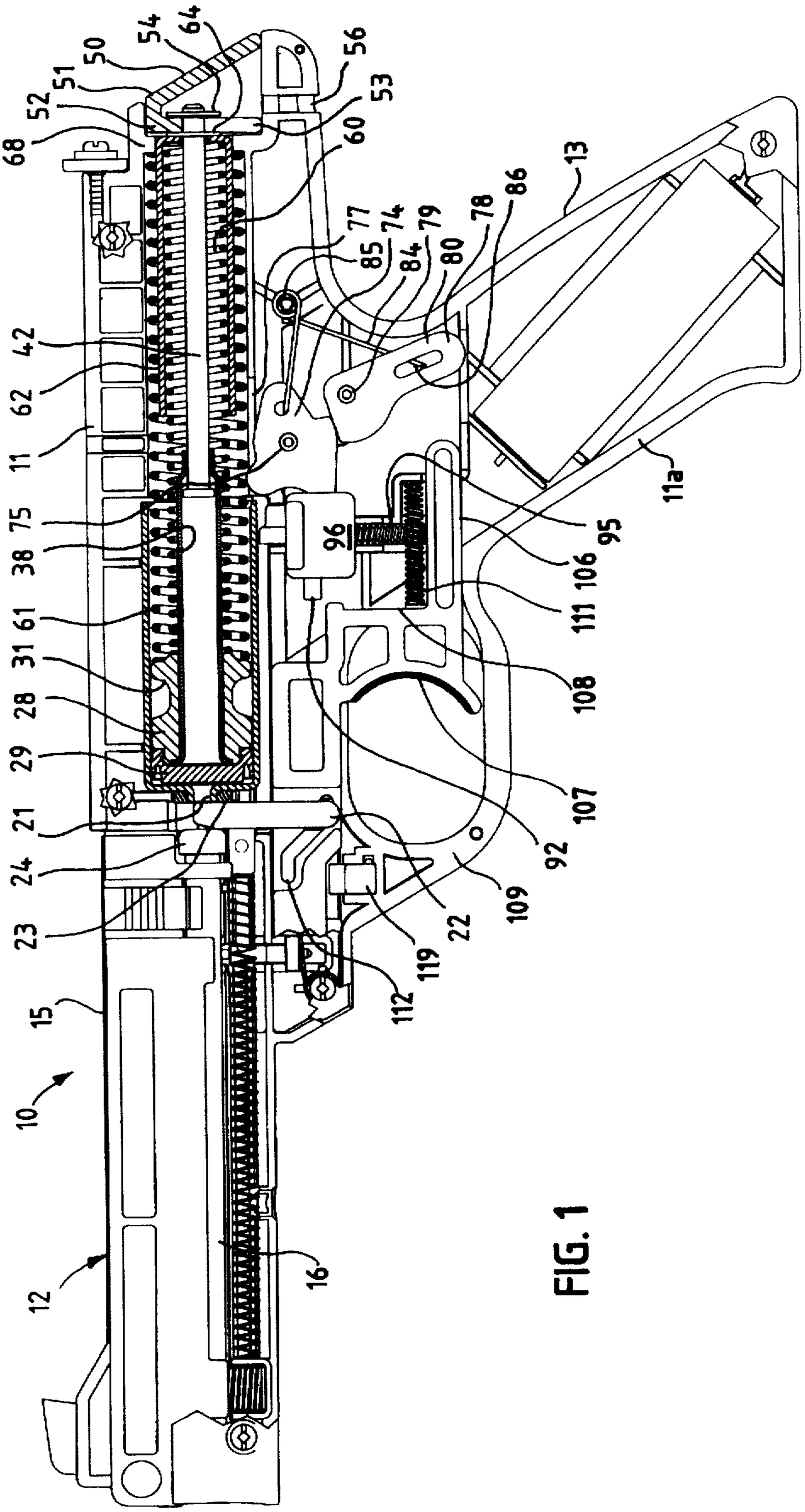

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FIG. 1

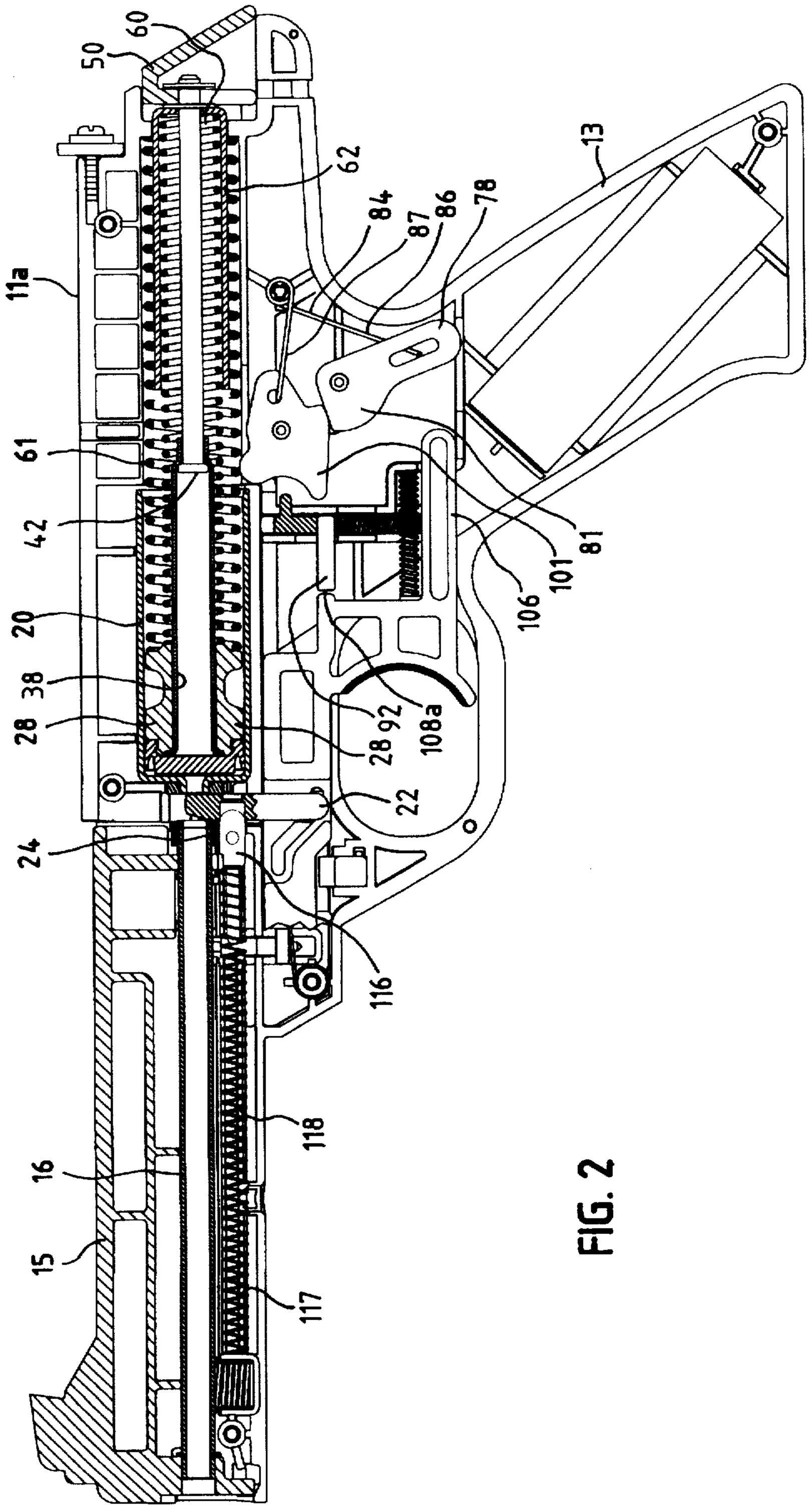
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FIG. 2

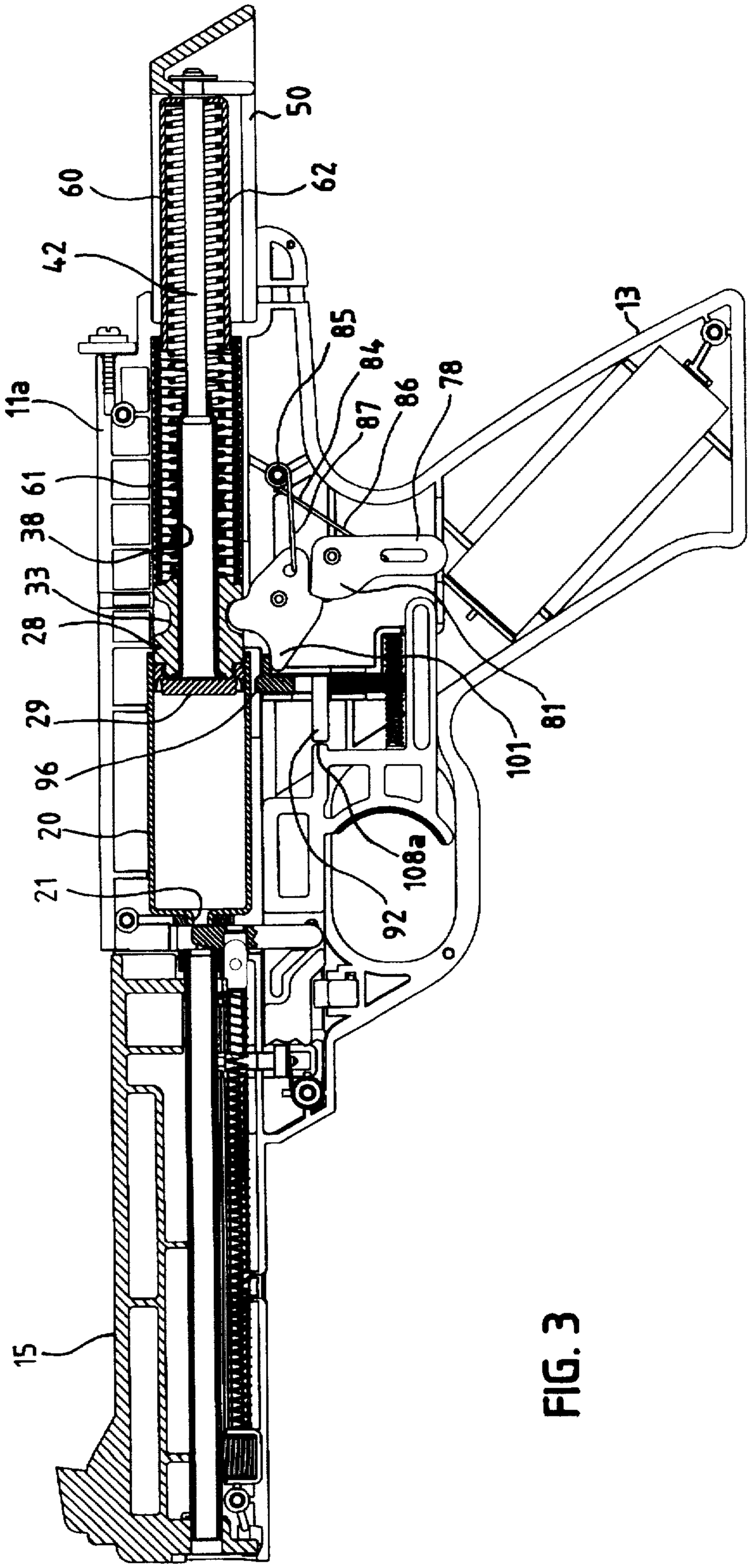
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FIG. 3

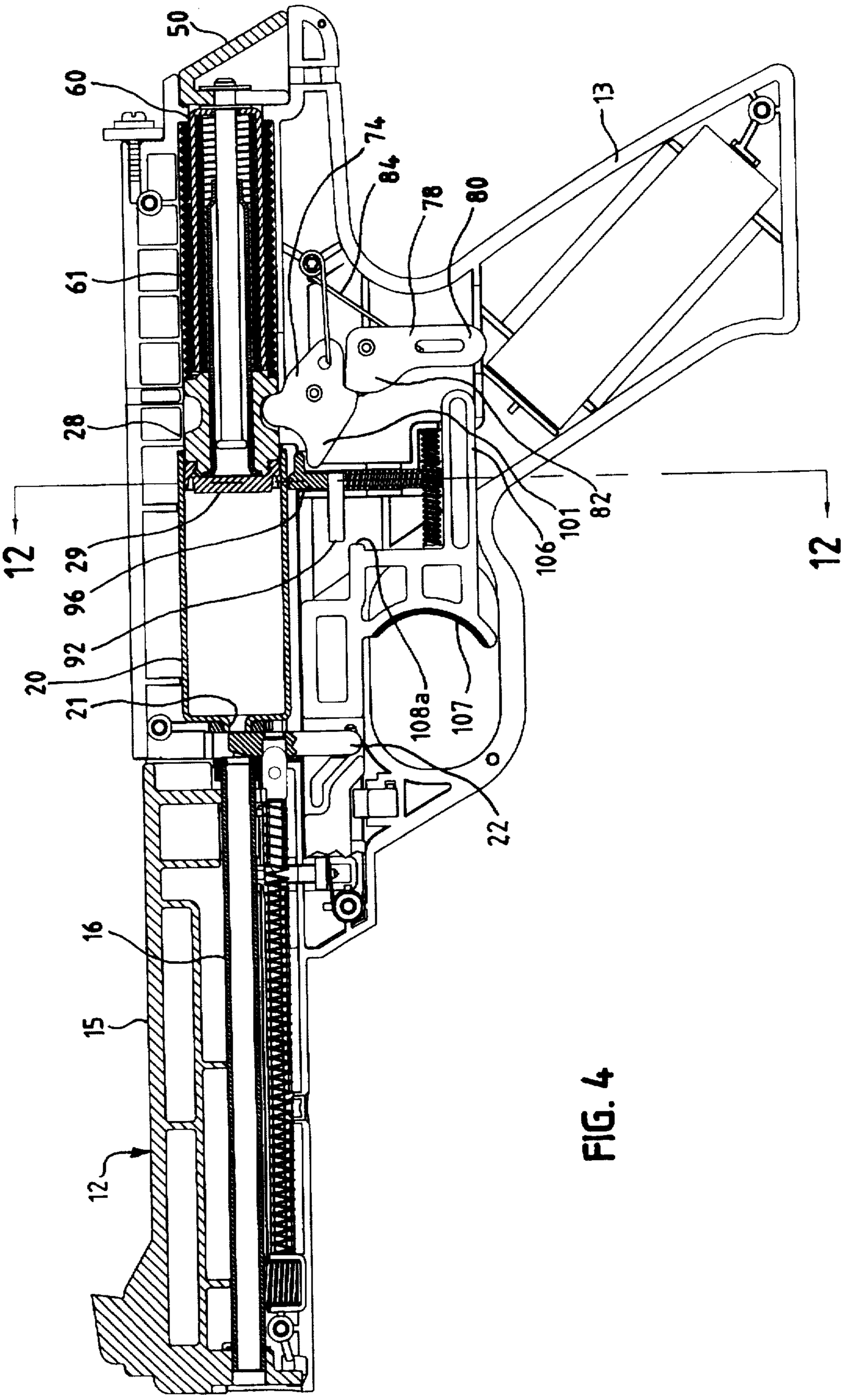
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FIG. 4

FIG. 5

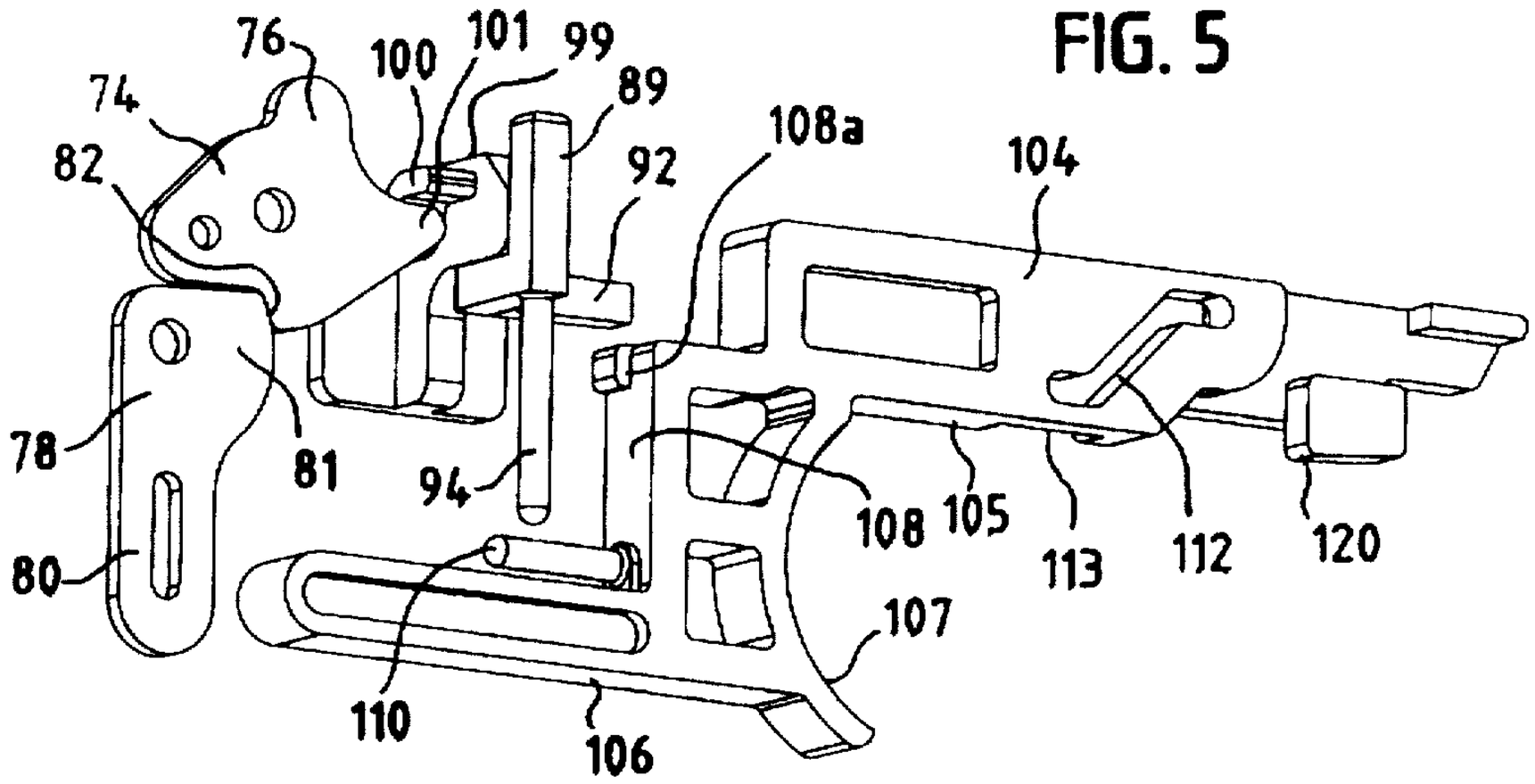


FIG. 10

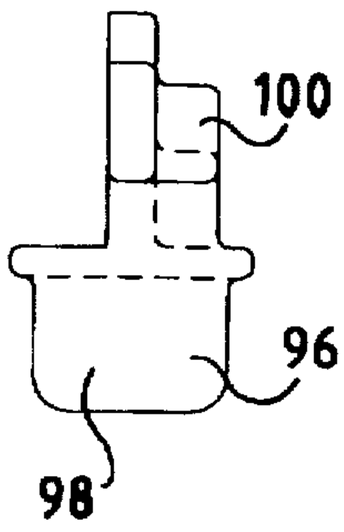
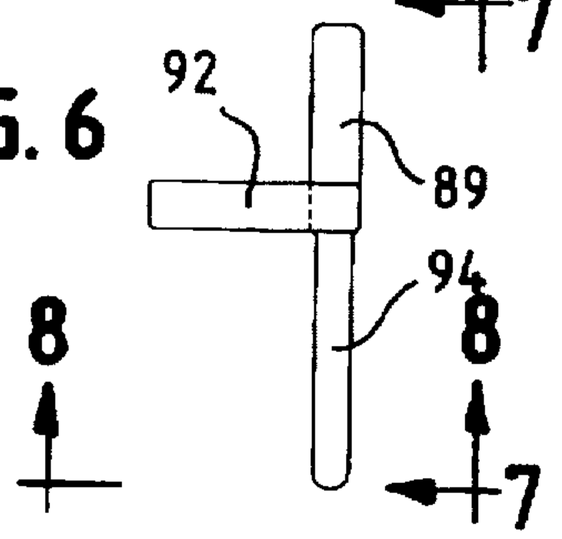


FIG. 6



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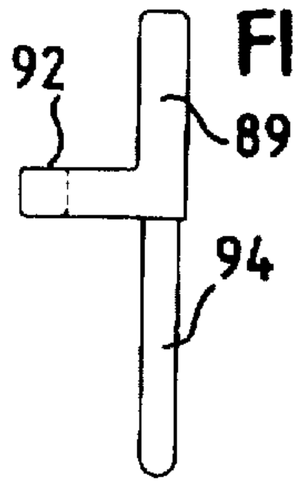

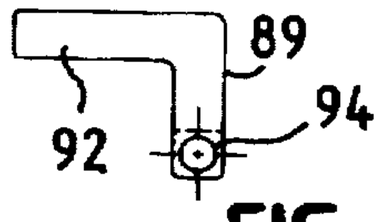

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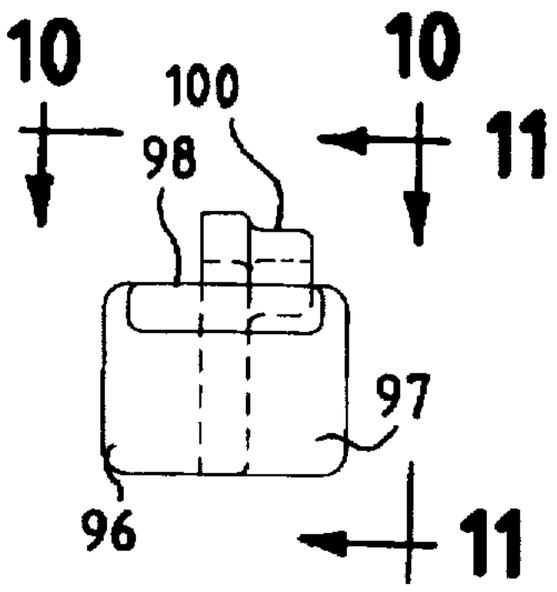

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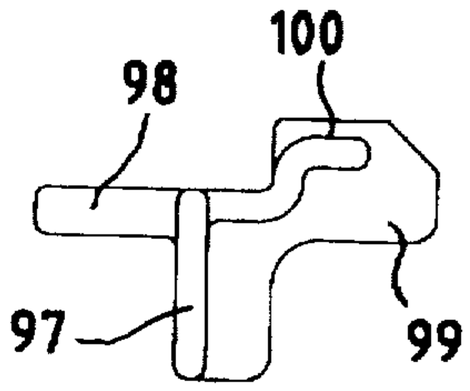
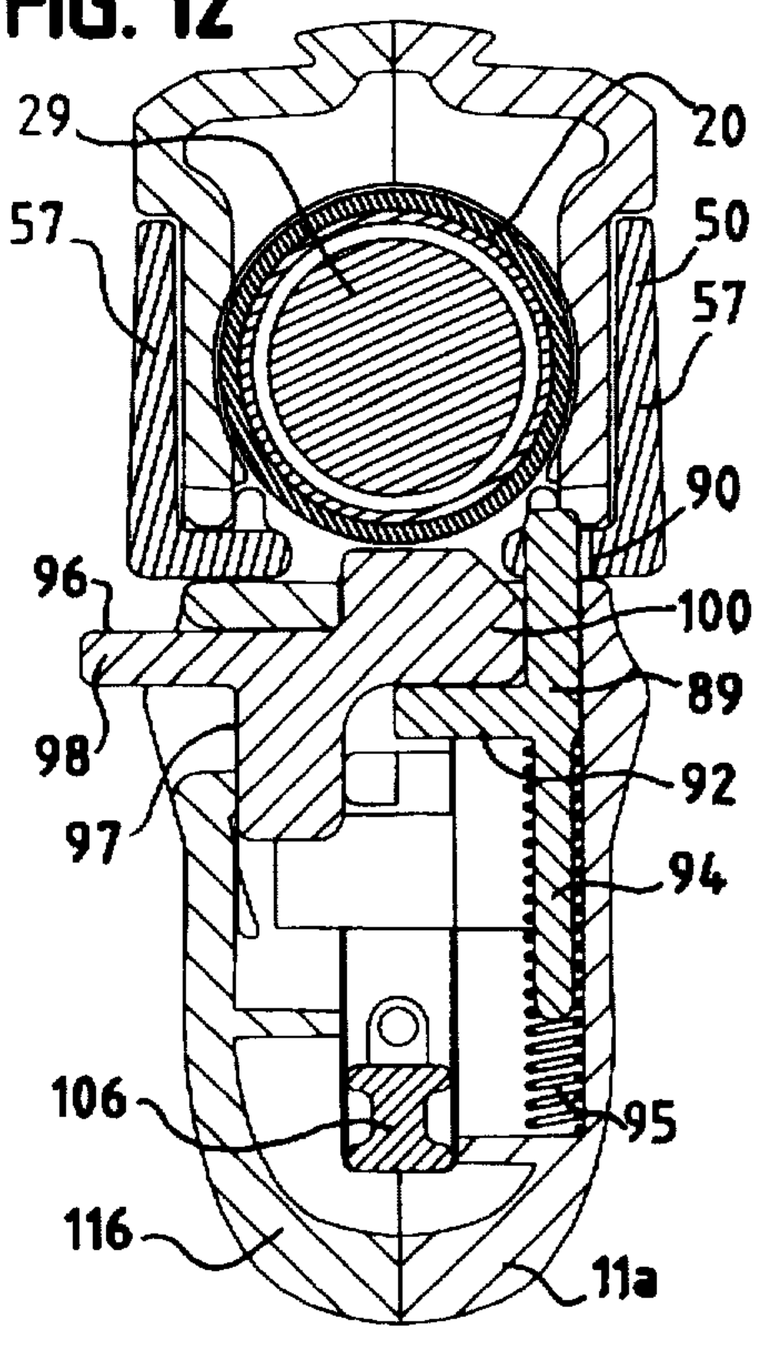


FIG. 11

FIG. 12



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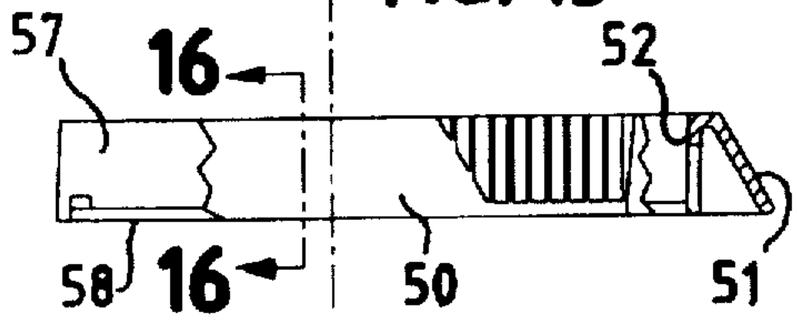

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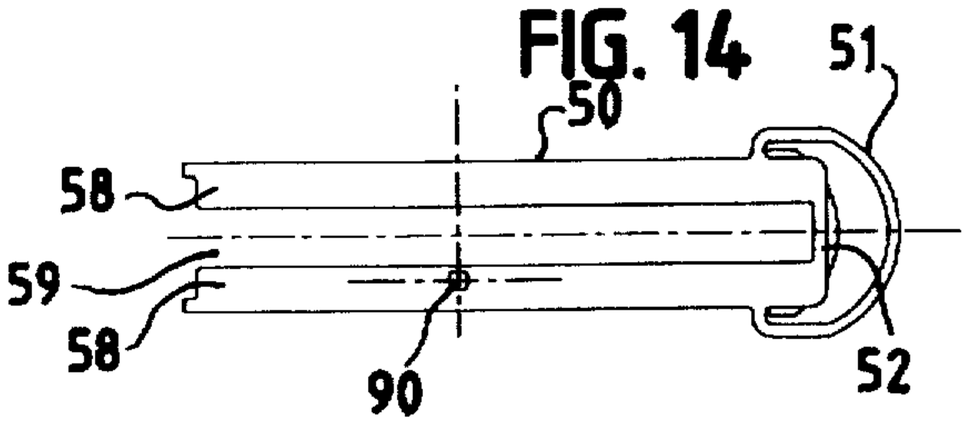
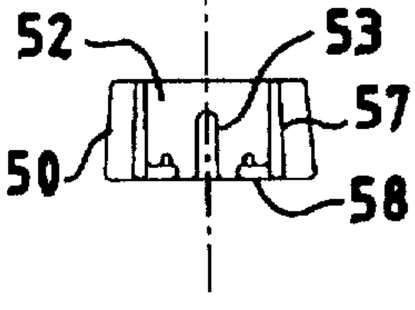


FIG. 15



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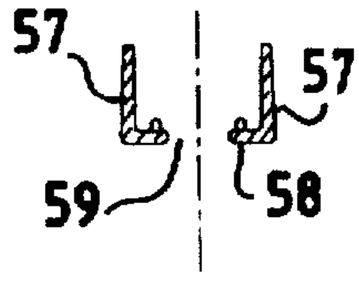

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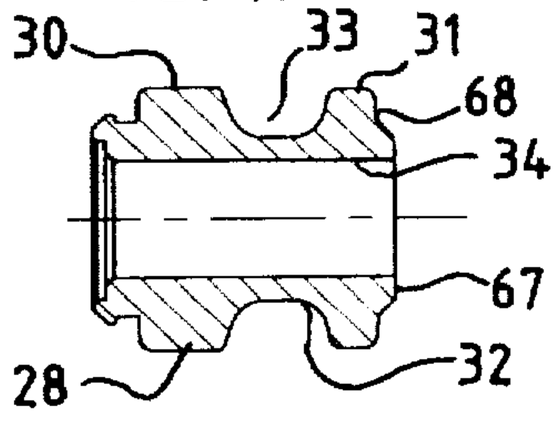


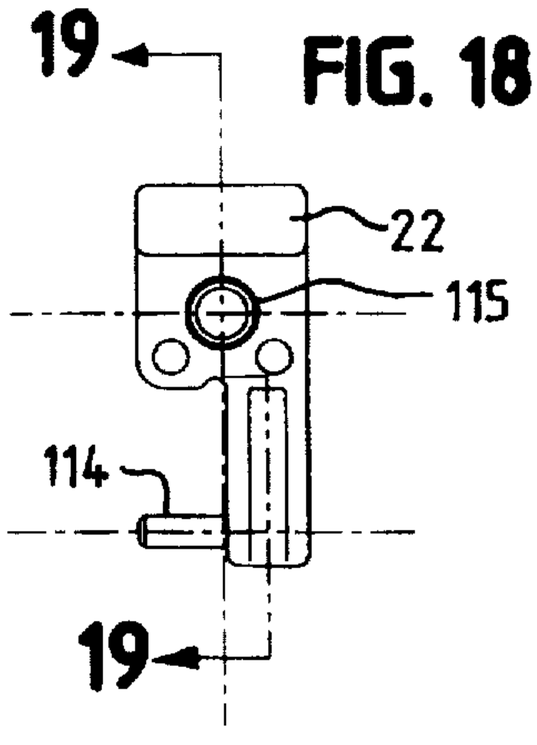
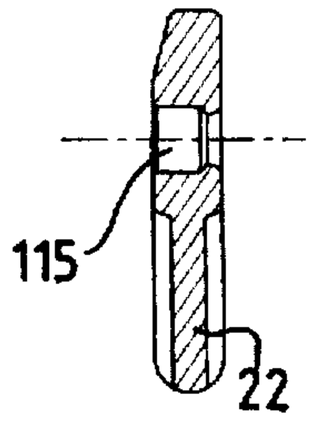
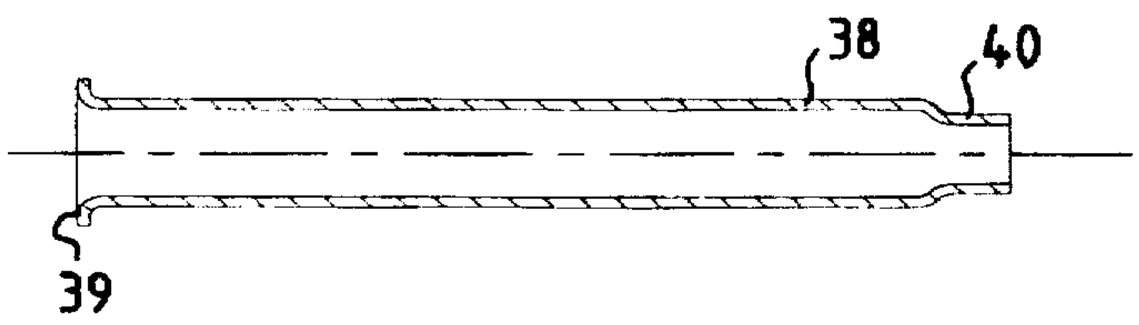


FIG. 18

FIG. 19





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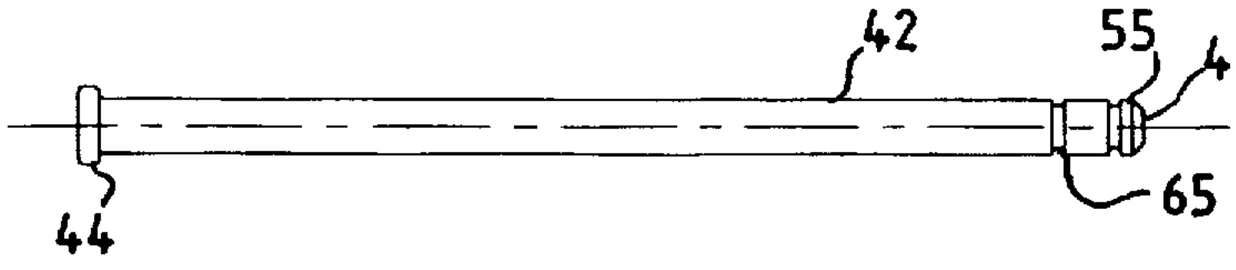
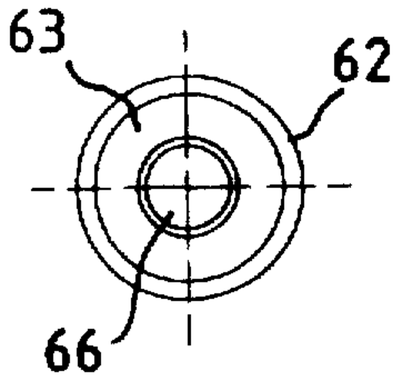


FIG. 21

FIG. 23



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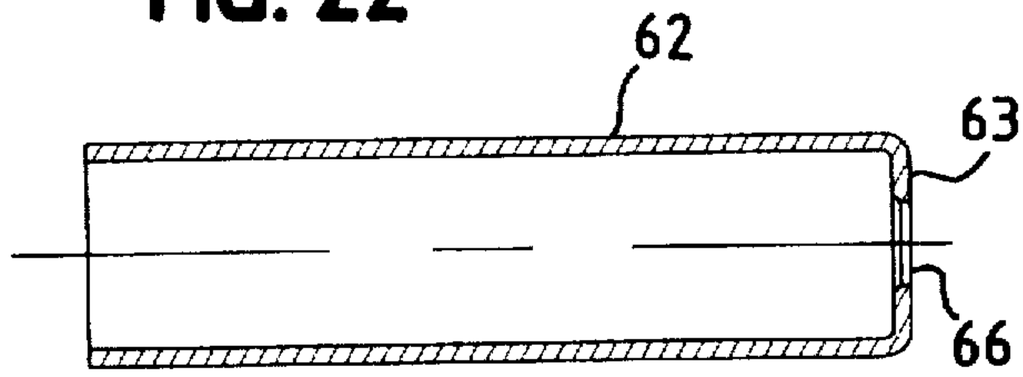

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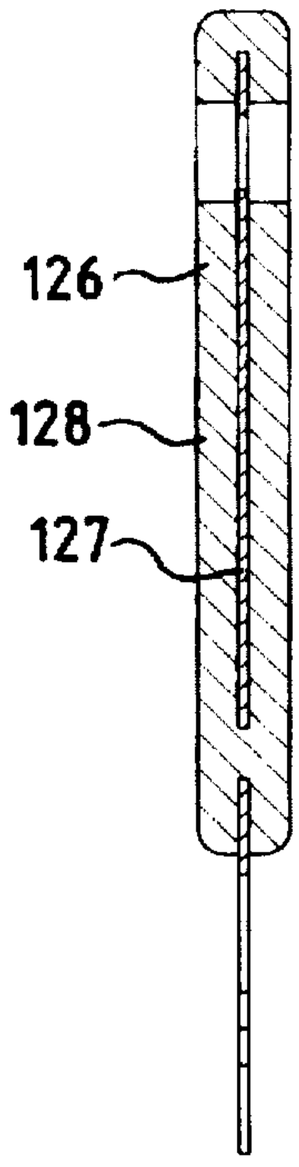

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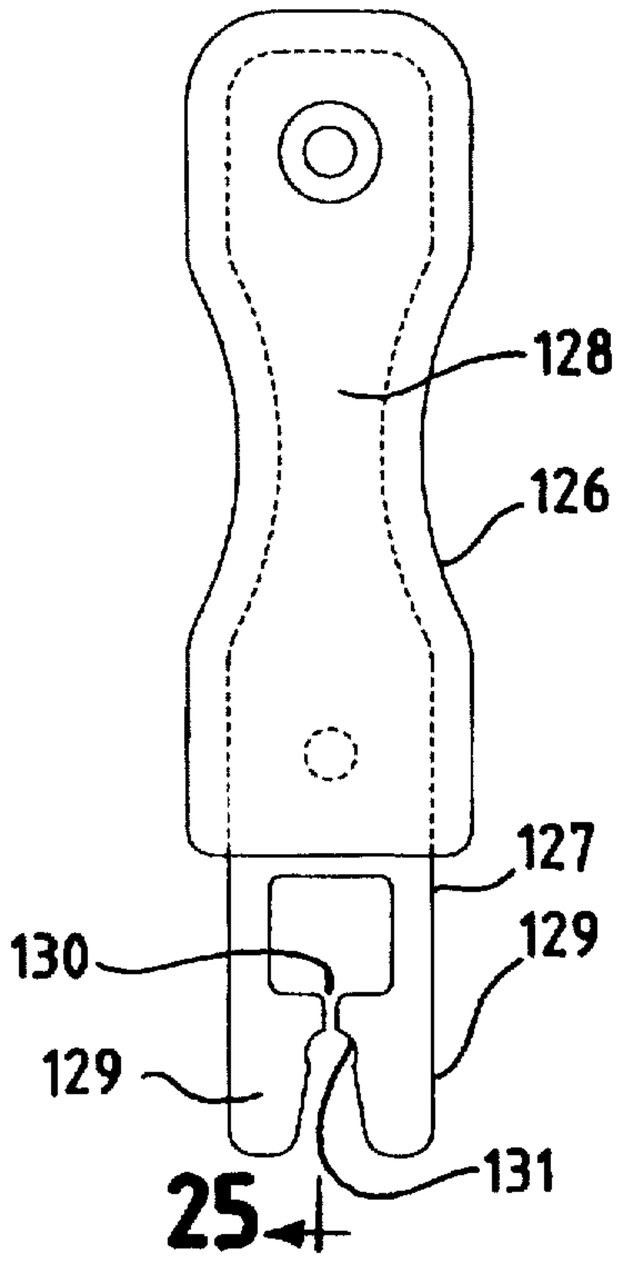

FIG. 24

FIG. 26

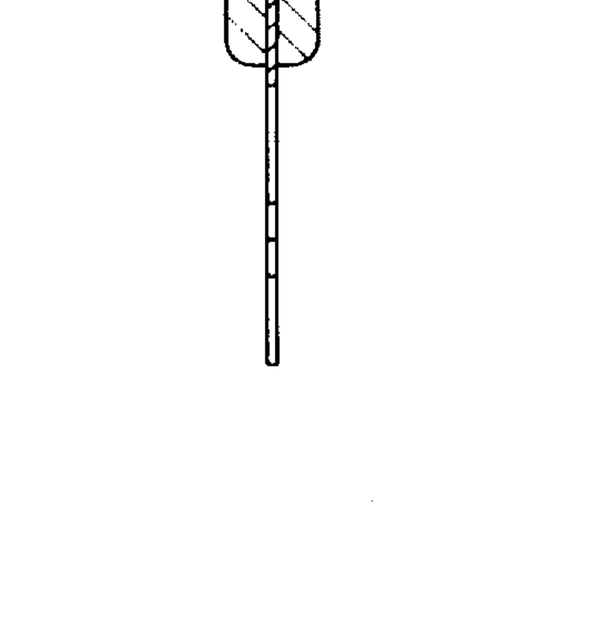

FIG. 27

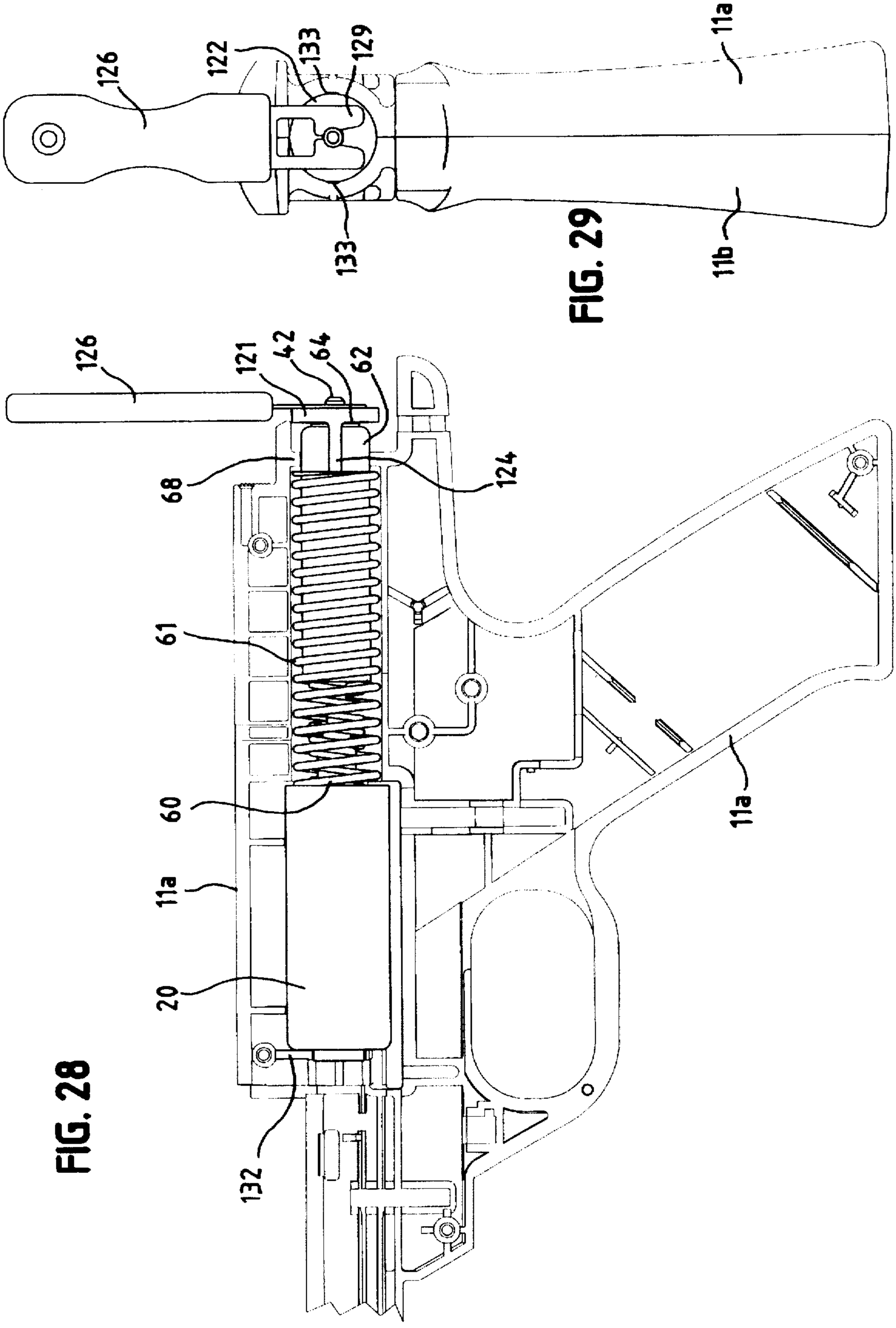
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FIG. 28

FIG. 29

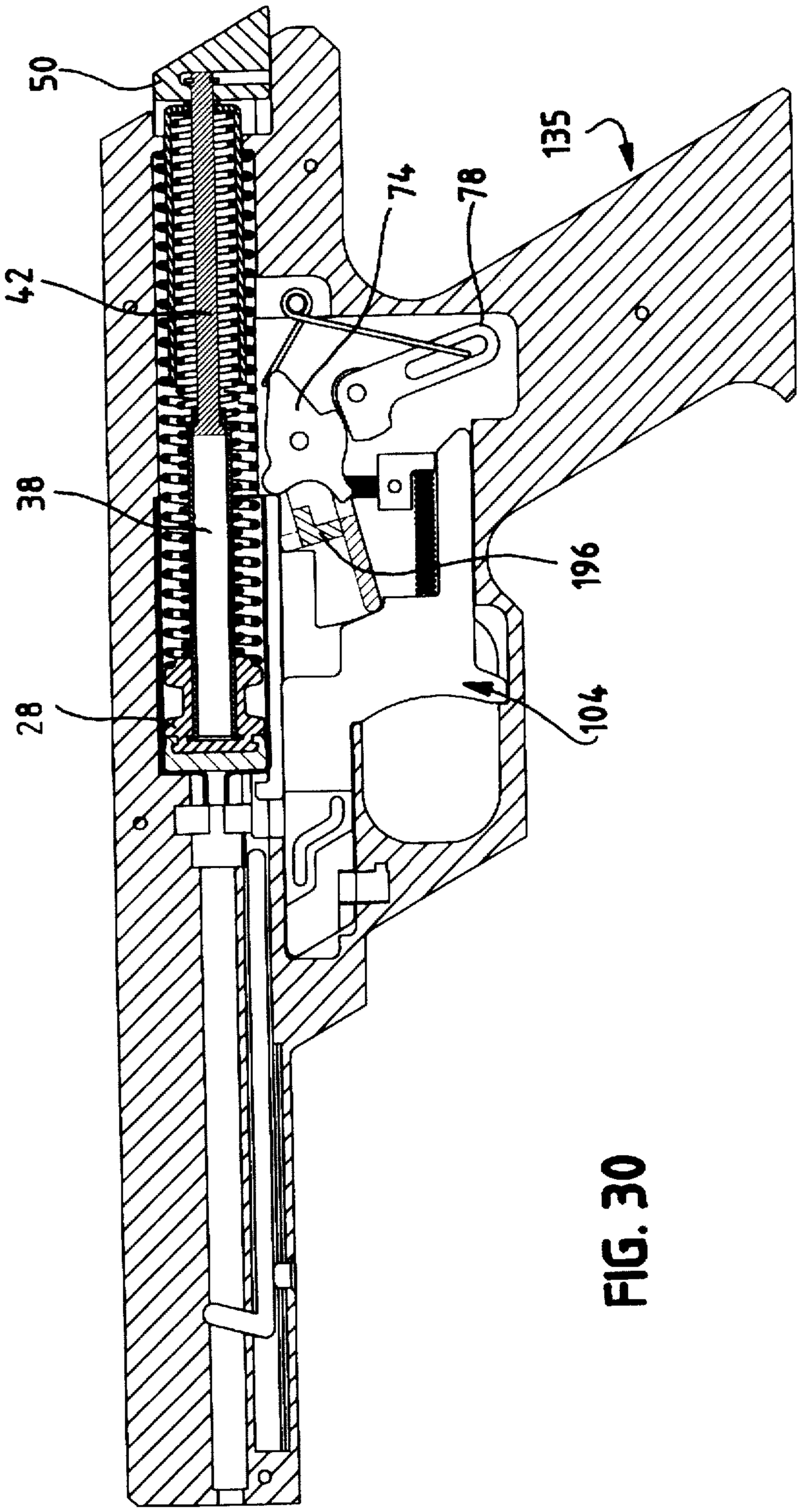

FIG. 30

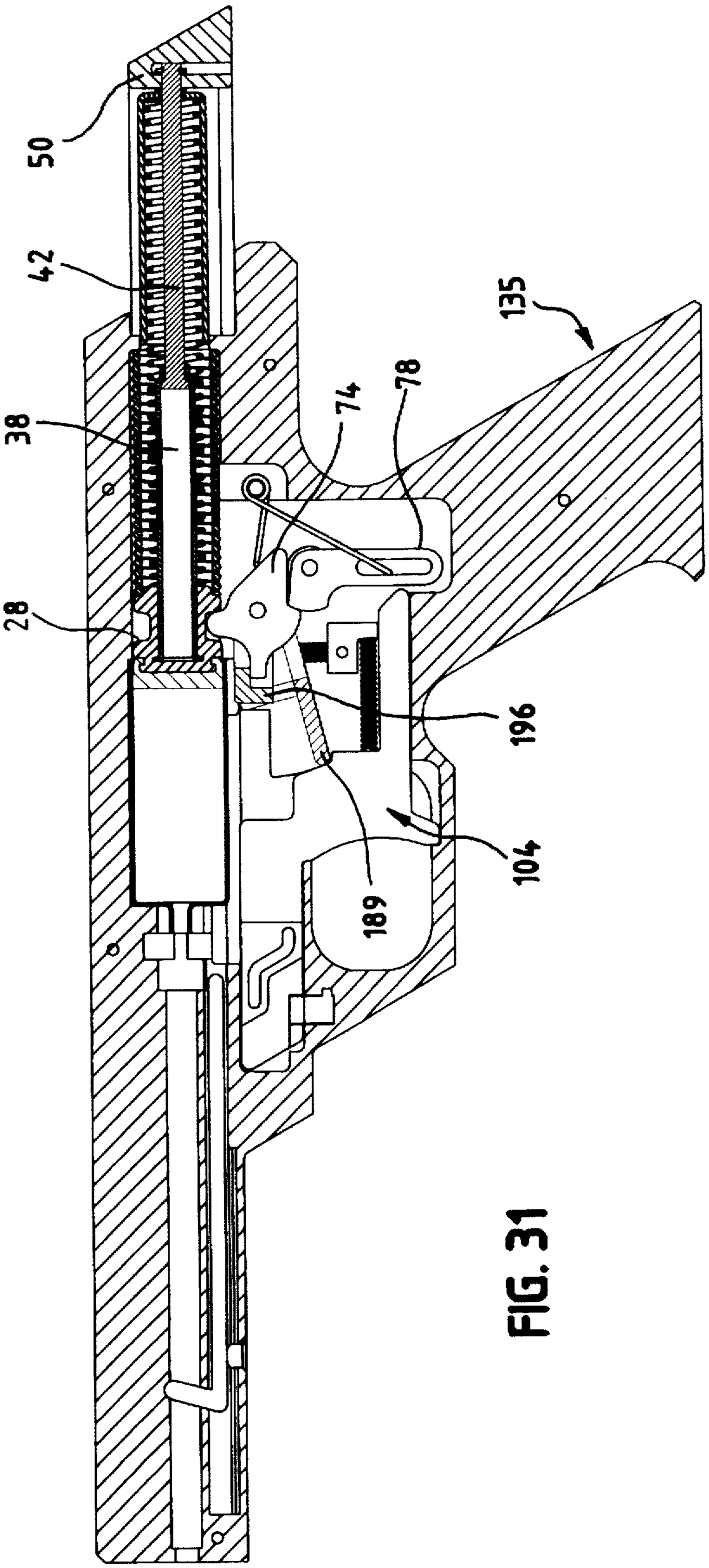

FIG. 31

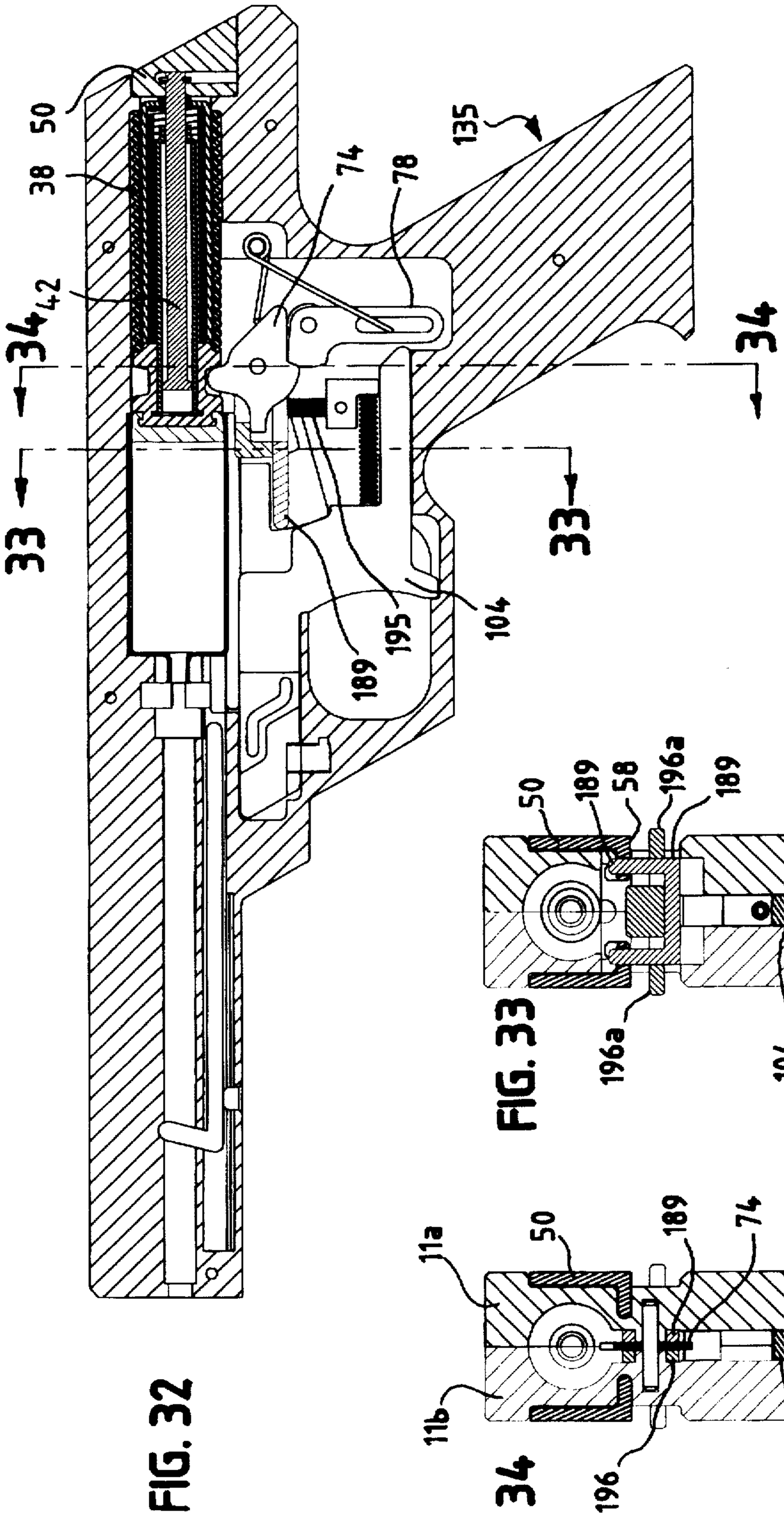

FIG. 32

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FIG. 34

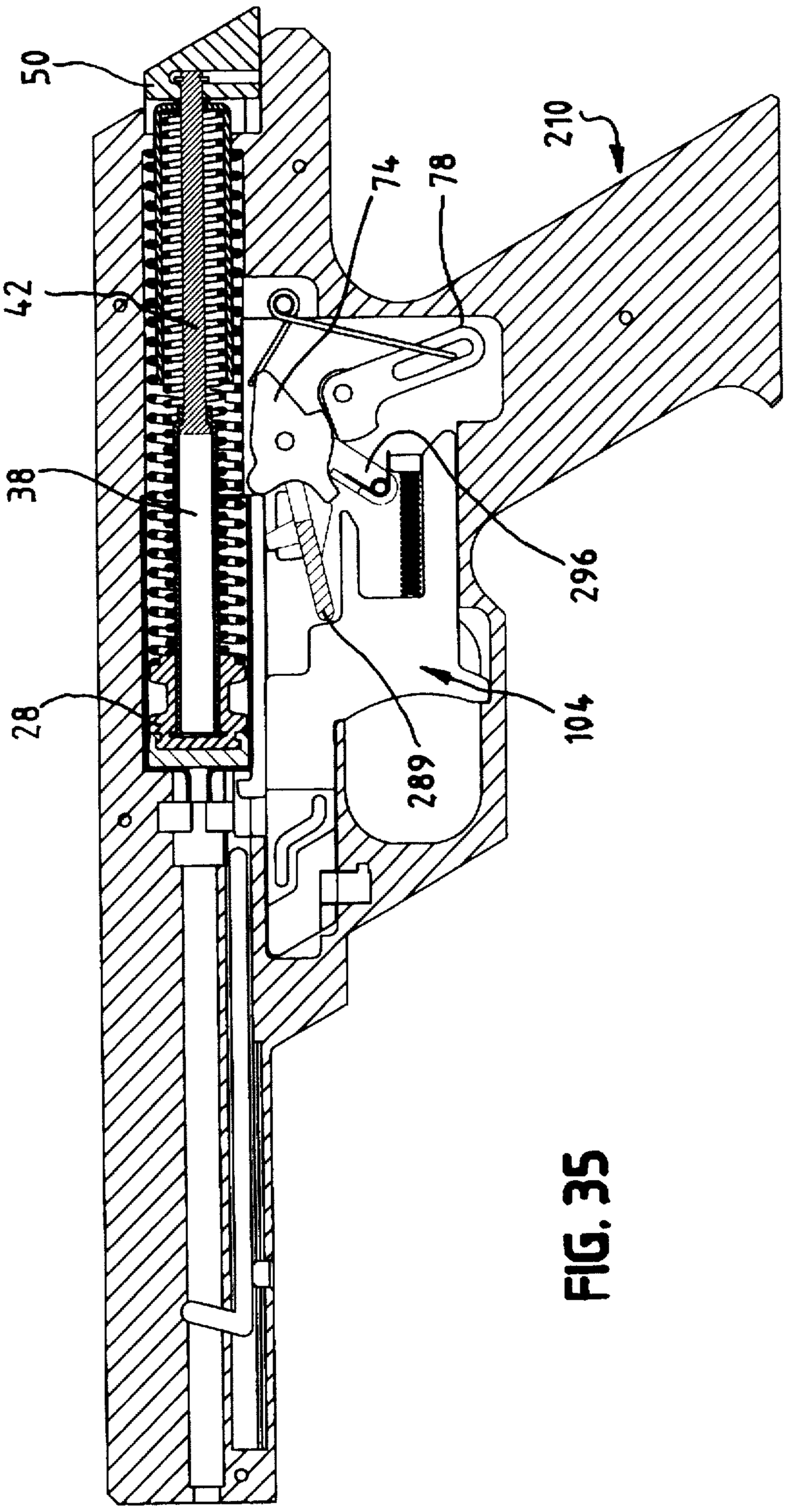
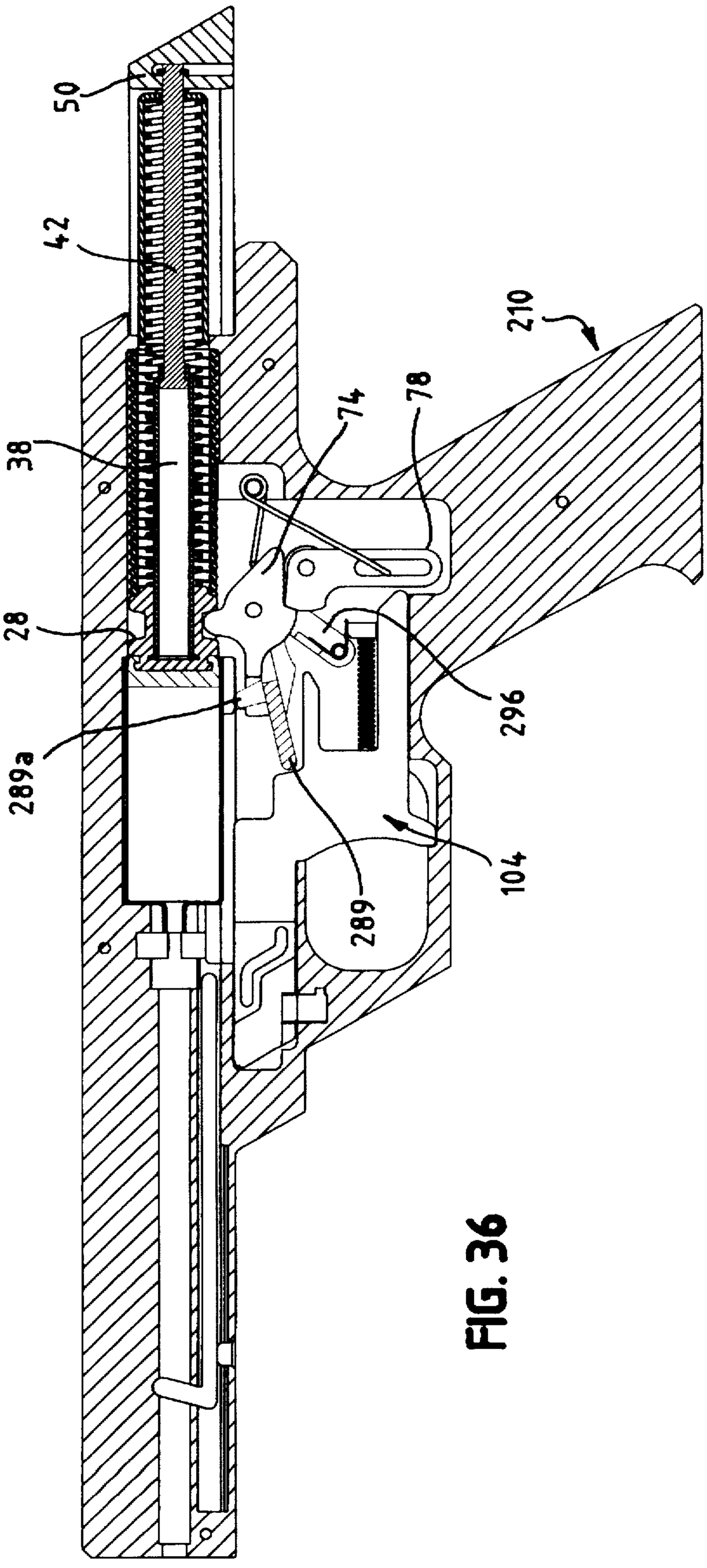


FIG. 35



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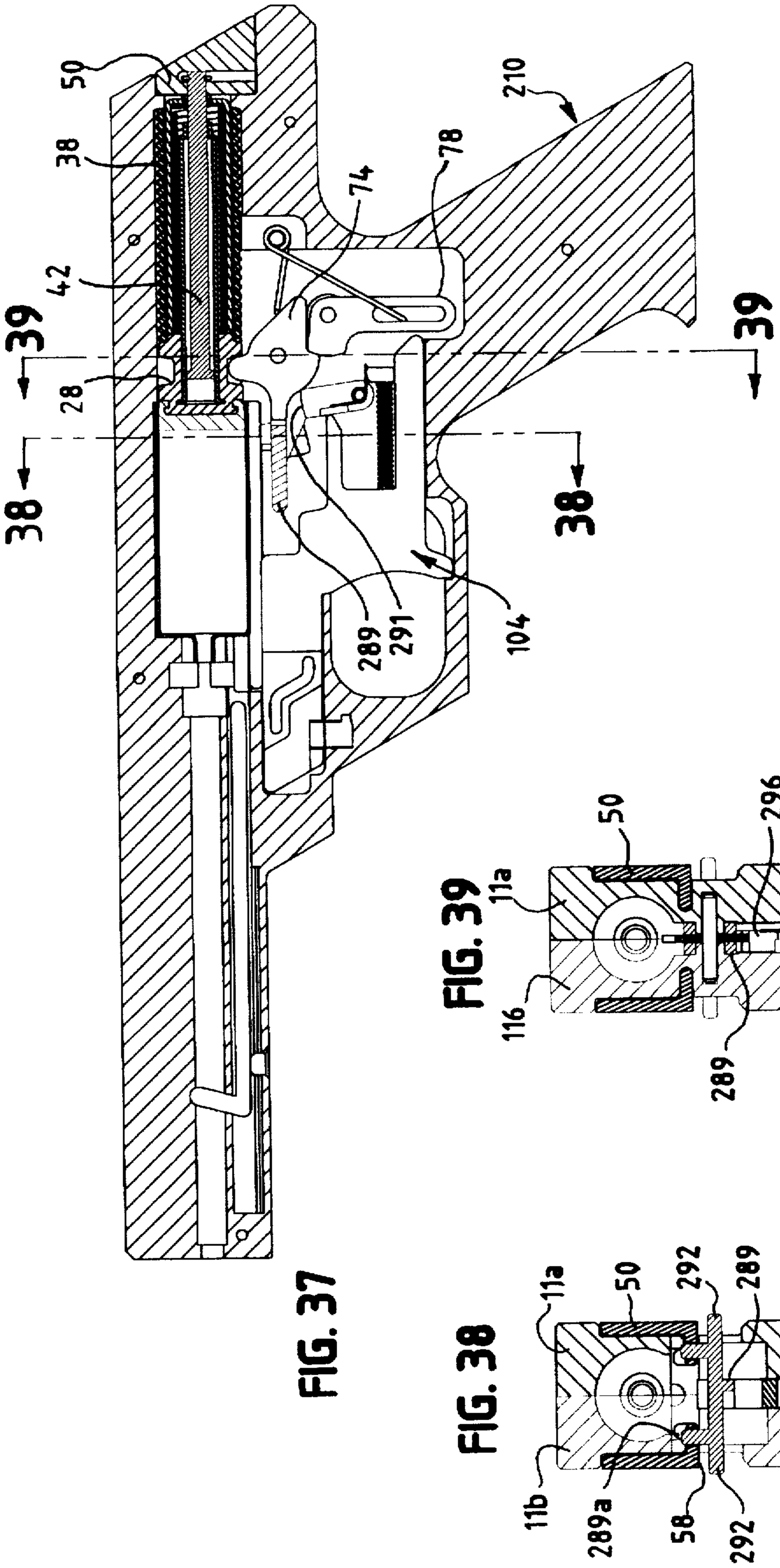

FIG. 37

FIG. 39

FIG. 38

SPRING AIR GUN WITH INTERLOCKING MECHANISM

BACKGROUND

This invention relates to spring air guns, and, more particularly, to a spring air gun with an interlocking mechanism for preventing movement of the cocking slide when the gun is cocked and for preventing movement of the trigger when the cocking slide is not in its firing position.

Spring air guns conventionally include a compression cylinder and a piston which is reciprocable within the compression cylinder for compressing air within the cylinder. The compressed air flows into the barrel of the gun at high velocity for propelling a projectile out of the barrel. The piston is driven by a main compression spring, and the piston is maintained in a cocked position by a sear. The sear is released from engagement with the piston when the trigger is pulled.

Certain types of spring air guns are cocked by a slide which pulls the piston rearwardly or away from the barrel to compress the main spring. A detent is engageable with the slide and must be released before the slide can be pulled rearwardly. When the detent is released, a second spring which is concentrically mounted within the main spring propels the slide rearwardly for a short distance. The sear prevents the detent from being released until the gun is fired to prevent the slide from being propelled rearwardly by the inner spring.

SUMMARY OF THE INVENTION

The invention provides a slide-cocking spring air gun with an interlocking mechanism which not only prevents the slide from being released from its cocked position unless the gun is fired but also prevents the trigger from being pulled unless the slide is in the cocked position. If the gun were fired when the slide is in its rearward or uncocked position, the slide would be propelled forwardly under the force of the main spring and possibly cause injury to the operator. When the slide returns to the forward, cocked position, the interlocking mechanism disengages the trigger and allows the gun to be fired. The invention also provides tools and a method for safely assembling and removing the springs of the gun.

DESCRIPTION OF THE DRAWING

The invention will be explained in conjunction with an illustrative embodiment shown in the accompanying drawings, in which

FIG. **1** is a fragmentary side sectional view of a spring air gun which is provided with the inventive interlocking mechanism, the gun being shown in the fired position;

FIG. **2** is a view similar to FIG. **1** showing the slide in a released position;

FIG. **3** is a view similar to FIGS. **1** and **2** showing the slide in the rearward position;

FIG. **4** is a view similar to FIGS. **1–3** showing the gun in the cocked and ready to fire position;

FIG. **5** is a perspective view of some of the parts of the interlocking mechanism;

FIG. **6** is an elevational view of the detent;

FIG. **7** is a view of the detent taken along the line **7—7** of FIG. **6**;

FIG. **8** is a bottom view of the detent taken along the line **8—8** of FIG. **6**;

FIG. **9** is an elevational view of the detent lever;

FIG. **10** is a top view of the detent lever taken along the line **10—10** of FIG. **9**;

FIG. **11** is a side view of the detent lever taken along the line **11—11** of FIG. **9**;

FIG. **12** is a sectional view taken along the line **12—12** of FIG. **4**;

FIG. **13** is a side view, partially broken away, of the slide;

FIG. **14** is a bottom view of the slide;

FIG. **15** is a front end view of the slide;

FIG. **16** is a sectional view taken along the line **16—16** of FIG. **15**;

FIG. **17** is a sectional view of the piston;

FIG. **18** is a front view of the loader;

FIG. **19** is a sectional view taken along the line **19—19** of FIG. **18**;

FIG. **20** is a sectional view of the piston tube;

FIG. **21** is a side view of the piston rod;

FIG. **22** is a sectional view of the piston sleeve;

FIG. **23** is a front end view of the piston sleeve;

FIG. **24** is an elevational view of the tool for inserting the main spring;

FIG. **25** is a sectional view taken along the line **25—25** of FIG. **24**;

FIG. **26** is an end view of the bushing for inserting the main spring;

FIG. **27** is a sectional view taken along the line **27—27** of FIG. **26**;

FIG. **28** is a fragmentary view of the right half of the receiver showing the method of inserting the main spring;

FIG. **29** is an end view showing the method of inserting the main spring;

FIG. **30** is a sectional view similar to FIG. **2** of a modified embodiment of a spring air gun;

FIG. **31** is a view similar to FIG. **3** showing the gun of FIG. **30**;

FIG. **32** is a view similar to FIG. **4** showing the gun of FIG. **30**;

FIG. **33** is a sectional view taken along the line **33—33** of FIG. **32**;

FIG. **34** is a sectional view taken along the line **34—34** of FIG. **32**;

FIG. **35** is a view similar to FIG. **2** showing another embodiment of a spring air gun;

FIG. **36** is a view similar to FIG. **3** showing the gun of FIG. **35**;

FIG. **37** is a view similar to FIG. **4** showing the gun of FIG. **35**;

FIG. **38** is a sectional view taken along the line **38—38** of FIG. **37**; and

FIG. **39** is a sectional view taken along the line **39—39** of FIG. **37**.

DESCRIPTION OF SPECIFIC EMBODIMENT

Referring to FIGS. **1–4**, a spring air gun **10** includes a frame or receiver **11**, a barrel assembly **12**, and a grip **13**. The frame includes left and right frame halves **11***a* and **11***b* (FIGS. **12** and **29**) which are bolted together. The particular barrel assembly illustrated is pivotally mounted on the frame and includes a housing **15** and a metal tubular barrel insert **16**.

A compression cylinder **20** is mounted within the frame and includes a nipple **21** which provides a small diameter outlet orifice. A loader **22** (see also FIGS. **18** and **19**) is slidably mounted in front of the nipple for moving a projectile into alignment with the outlet orifice and the bore of the barrel insert. Gaskets or seals **23** and **24** on the nipple **21** and the barrel insert **16** sealingly engage the loader when the gun is fired.

A piston **28** is reciprocably mounted in the compression cylinder **20**. A gasket or seal **29** is carried by the forward end of the piston and sealingly engages the inside surface of the cylinder. The piston is somewhat spool-shaped and includes a pair of annular rim portions **30** and **31** (FIG. **17**) which are connected by reduced-diameter central portion **32** which provides an annular recess **33** between the rim portions. A bore **34** extends axially through the piston.

A hollow piston tube **38** (see also FIG. **20**) extends through the bore of the piston. The front end of the piston tube includes an outwardly extending flange which engages the front end of the piston, and the rear end of the piston tube includes a necked-down end portion **40**.

A piston rod **42** (see also FIG. **21**) is slidably received within the necked-down end portion **40** of the piston tube. The forward end of the piston rod includes a radially enlarged flange **44** which is engageable with the small diameter end portion **40** to prevent the piston rod from being withdrawn from the end portion **40**.

The rear end **46** of the piston rod **42** is attached to a slide **50** (see also FIGS. **12–16**) which is slidably mounted on the frame for sliding movement in the direction of the axis of the compression cylinder **20**. The rear end of the slide includes an angled end wall **51** and a transverse rear **52** having a slot **53** wall through which the rear end **46** of the piston rod extends. The piston rod is secured to the slide by a locking ring **54** (FIG. **1**) which is inserted into an annular groove **55** (FIG. **21**) in the piston rod. A slot **56** (FIG. **1**) in the receiver below the transverse wall **52** provides access for inserting the locking ring. The slide **50** includes a pair of longitudinally extending side walls **57** which extend along the outside of the frame and a pair of bottom walls **58** which extend laterally inwardly into longitudinal grooves in the frame. The bottom walls are separated by a central slot **59**.

A pair of concentric springs **60** and **61** (FIG. **1**) surround the piston tube **38**, and the rear ends of the springs are separated by a cylindrical spring sleeve **62** (see also FIGS. **22** and **23**). The spring sleeve includes a rear wall **63** which butts against a locking ring **64** which is inserted into an annular groove **65** (FIG. **21**) in the piston rod. The piston rod **42** extends through an opening **66** in the rear wall **63**. The small diameter inner spring **60** is compressed between a shoulder **67** (FIG. **17**) on the piston **28** and the rear wall **63** of the spring sleeve. The large diameter outer spring **61** is compressed between a shoulder **68** (FIG. **17**) on the piston and a radially extending flange **68** (FIG. **1**) on the frame. The spring sleeve **62** and the inner spring **60** extend through an opening provided through the flange **68**.

A sear **74** is rotatably mounted on the frame by a pin **75**. The sear includes a projection **76** (FIG. **5**) which can extend through the slot **59** between the bottom walls **58** of the slide **50**, through a slot **77** (FIG. **1**) in the receiver halves, and into the recess **33** of the piston to engage the rear rim **31** of the piston to maintain the piston in the cocked position illustrated in FIGS. **3** and **4**.

The sear is maintained in the cocked position by a cam **78** which is rotatably mounted on the frame by a pin **79**. Referring to FIG. **5**, the cam includes a lever arm **80** and a projection **81** which engages a shoulder **82** on the sear to prevent the sear from rotating counterclockwise under the force of the springs **60** and **62**.

A spring **84** (FIG. **3**) is wrapped around a pin **85** on the frame. One leg **86** of the spring engages the lever arm **80** to urge the lever arm to rotate clockwise. Another leg **87** of the spring extends through an opening in the sear and urges the sear to rotate clockwise when the sear is cocked.

A detent **89** (see also FIGS. **5–8** and **12**) is slidably mounted on the frame for movement perpendicular to the axis of the compression cylinder **20**. In FIGS. **4** and **12** the detent extends upwardly through an opening **90** (see also FIG. **14**) in the bottom wall **58** of the slide and prevents the slide from moving rearwardly under the force of the small diameter spring **60**. The detent includes an L-shaped laterally and forwardly extending arm **92** and a downwardly extending leg **94** on which is mounted a detent spring **95** (FIG. **12**).

A detent lever **96** (see also FIGS. **5** and **9–12**) is slidably mounted on the frame for engagement with the arm **92** of the detent. The detent lever includes a slide portion **97** which slidably engages the inside wall of the left frame half **11***a*, a push button **98** which extends laterally outwardly through a slot in the left frame half, a first laterally inwardly extending shoulder **99**, and a second laterally inwardly extending shoulder **100**. The shoulder **99** extends above the arm **92** of the detent, and the shoulder **100** is engageable with a projection **101** (FIG. **5**) on the sear when the sear is cocked.

A trigger **104** is slidably mounted on the frame and includes a front slide portion **105** (FIG. **5**), a rear projection **106**, a finger portion **107**, and a stop shoulder **108** having a projection **108***a*. As can be seen in FIG. **1** the front slide portion is slidably supported by a flat wall on the frame, and the finger portion extends into the opening of a trigger guard **109** on the frame. The rear projection **106** is also slidably supported by the frame. A rod **110** (FIG. **5**) extends rearwardly from the finger portion above the rear projection, and a trigger spring **111** (FIG. **1**) is mounted on the rod.

A generally Z-shaped camming slot **112** extends through a recessed portion **113** in the front slide portion **105** of the trigger for reciprocating the loader **22**. As described in U.S. Pat. No. 5,165,383, the loader includes a pin **114** (FIG. **18**) which extends into the slot **112** and an opening **115** for holding a projectile such as a BB or a pellet. When the trigger is in the unfired position illustrated in FIGS. **1–4**, the projectile is positioned below the barrel **16** and the outlet orifice of the compression cylinder **20**. When the trigger is pulled rearwardly, the loader is cammed upwardly by the slot **112** to position the projectile in alignment with the barrel and the outlet orifice before the sear is released.

BB's or pellets are fed to the loader by a BB pusher **116** (FIG. **2**) which is slidably mounted in a BB magazine **117** and which is biased toward the loader by a spring **118**.

A safety **119** (FIG. **1**) on the frame can be moved behind a projection **120** (FIG. **5**) on the front slide portion **105** of the trigger to prevent the trigger from being pulled.

FIG. **1** illustrates the gun after the gun has been fired. The piston **38** is in the forward portion of the compression cylinder **20**. The necked-down rear end portion **40** of the piston tube **38** is a short distance behind the flange **44** on the front end of the piston rod **42**. The detent **89** extends into the opening **90** in the bottom of the slide and locks the slide against rearward movement.

The gun cannot be cocked until the detent lever **96** is pushed downwardly to withdraw the detent **89** from the

opening **90** in the slide **50**. Since the sear has been rotated into the fired position, the projection **101** on the sear does not engage the shoulder **100** on the detent lever and does not prevent depressing the detent lever.

FIG. **2** illustrates the gun after the detent lever **96** has been pushed downwardly to withdraw the detent **89** from the opening **90** in the slide. The detent lever **96** is sectioned in FIG. **2** to illustrate the lower position of the detent arm **92**.

When the detent is withdrawn from the slide **50**, the small diameter spring **60** propels the slide rearwardly a short distance until the flange **44** on the piston rod engages the necked-down end **40** of the piston tube. The operator then cocks the large spring by pulling the slide rearwardly (FIG. **3**) until the recess **33** in the piston moves over the sear. The spring **84** rotates the sear clockwise into engagement with the rim **31** of the piston and rotates the cam **78** clockwise so that the projection **81** locks the sear in the cocked position.

When the slide **50** is in its rear position illustrated in FIG. **3**, the detent **89** is held depressed by the bottom wall **58** of the slide so that the arm **92** on the detent is engageable with the stop projection **108***a* of the trigger. The trigger is thereby prevented from being pulled until the slide returns to its forward position. If the trigger could be pulled while the slide was in the rear position, the slide would accelerate forwardly under the force of the large diameter spring **61** and could possibly cause injury to the operator.

When the slide is moved to its rear position and the sear rotates into engagement with the piston (FIG. **3**), the projection **101** on the sear moves into position below the shoulder **100** on the detent lever **96** and locks the detent lever in the raised position. The detent lever cannot be depressed until after the gun has been fired.

When the slide **50** is returned to its forward position illustrated in FIG. **4**, the small diameter spring **60** is compressed and the detent **89** is forced by the detent spring **95** to move upwardly into the opening **90** in the bottom wall **51** of the slide to lock the slide. The detent arm **92** moves above the stop projection **108***a* of the trigger, allowing the trigger to be pulled.

The gun is in the cocked, ready-to-fire position in FIG. **4**. Both the large diameter main spring **61** and the small diameter spring **60** are compressed behind the piston **28**. The piston is prevented from moving forwardly by the sear **74**. The slide **50** is prevented from moving rearwardly by the detent **89** which extends upwardly through the opening **90** in the slide bottom wall **58** (FIG. **14**). The detent lever **96** is prevented from moving downwardly by the projection **101** on the sear which is engageable with the shoulder **100** on the detent lever. The arm **92** on the detent is above the stop projection **108***a* on the trigger so that the detent does not prevent the trigger from being pulled.

When the trigger is pulled rearwardly, the rear projection **106** pushes the lever arm **80** of the cam **78** to rotate the cam counterclockwise out of engagement with the shoulder **82** of the sear. The sear is thereby freed to rotate counterclockwise under the force of the compressed springs **60** and **62**, and the piston is driven forwardly within the compression cylinder **20** by the springs. The piston rapidly compresses the air within the compression cylinder, and the compressed air flows at high velocity through the outlet nipple **21** to drive the projectile from the loader **22** and through the barrel.

The detent lever **96** is locked in its raised position by the sear, and the detent lever cannot be lowered to withdraw the detent **89** from the slide until after the gun is fired. If the slide could be released before the gun is fired, the slide would accelerate rearwardly under the force of the small diameter spring **60** and possibly cause injury to the operator.

FIGS. **28** and **29** illustrate the method and tools which are used to assemble and disassemble the inner and outer springs **60** and **61**. The piston rod **42** is inserted into the piston tube **38**, and the piston tube can be conveniently held by inserting the piston tube over a mandrel which has an outside diameter of approximately the same as the inside diameter of the piston tube. The piston **28** is then inserted over the piston rod **42** and the piston tube **38** until the piston abuts against the flange **39** on the front end of the piston tube. The inner spring **60** is then inserted over the piston rod and the piston tube, the spring sleeve **62** is inserted over the inner spring **60**, and the piston sleeve is pushed toward the piston to compress the inner spring until the rear end of the piston rod **42** extends through the opening **66** in the spring sleeve. The locking ring **64** is inserted on the end of the piston rod to prevent the rod from being withdrawn through the opening **66** in the spring sleeve.

The outer spring **61** is then inserted over the spring sleeve **62** until it butts against the piston **28**. The rear end of the outer spring **61** is then compressed forwardly beyond the rear end of the spring sleeve by a bushing **121** (FIGS. **26** and **27**) as shown in FIG. **28**. The bushing includes a disc **122** having an opening **123** for the piston rod **42** and a pair of legs **124**. The bushing is pushed over the end of the piston rod **42** until the disc abuts the locking ring **64**. The legs **124** extend alongside the spring sleeve **62** and compress the outer spring **61**. A locking tool **126** is inserted onto the spring rod to retain the bushing **121** on the spring rod. The locking tool includes a metal plate **127** (FIGS. **24** and **25**) and a handle **128** which is molded around the plate. The plate includes a pair of resilient prongs **129** which are separated by a slit **130**. Each prong includes an arcuate recess **131** so that the prongs can be inserted into the locking groove **55** (FIG. **21**) on the piston rod **42**.

The piston tube **38** is then removed from the mandrel, and the piston seal **29** is inserted on the front end of the piston. The flange **39** on the piston tube retains the piston on the piston tube even though the springs **60** and **61** are compressed. The compression tube **20** is then inserted over the forward end of the piston.

The compression tube **20**, piston **28**, piston tube **38**, piston rod **42**, springs **60** and **61**, spring sleeve **62**, bushing **121**, and locking tool **126** are then inserted as a unit into one of the receiver halves as illustrated in FIG. **28**. The forward end of the compression tube **20** butts against a rib **132** on the receiver, and the rear end of the outer spring **61** is positioned slightly forwardly of the flange **68**.

After the other components of the gun are inserted into the receiver half, the other half of the receiver is mated with the first half, and the two halves of the receiver are connected by bolts. The flange **68** on each receiver half is provided with a slot **133** (FIG. **29**) for accomodating one of the legs **124** of the bushing **121**. After the receiver halves are connected, the locking tool **126** is removed from the piston rod **42**, and the bushing is slid rearwardly off of the piston rod. The outer spring **61** is retained by the flange **68**. The slide **50** can then be mounted on the receiver and secured to the piston rod **42** by the locking ring **54** (FIG. **1**).

The gun can be disassembled by following the reverse procedure.

FIGS. **30–34** illustrate a modified embodiment of a spring air gun **135**. The gun **135** is similar to the gun **10** and the same reference numerals are used for corresponding parts.

The gun **135** includes a detent **189** and a detent lever **196** which are pivotally mounted in the frame on the same pin as the sear for generally arcuate movement. In FIG. **30** the

detent lever is in its lower position in which it releases the slide **50** and engages the trigger **104** to prevent the trigger from being fired.

In FIG. **31** the slide **50** is pulled to the right, and the sear **74** has rotated into engagement with the piston **28**. The sear rotates the detent lever **196** upwardly, but the detent **189** remains in blocking position against the trigger **104** so that the trigger cannot be pulled. The detent is prevented from moving out of its blocking position by the bottom walls **58** of the slide **50**.

In FIG. **32** the slide **50** has been pushed to its forward position, and the gun is cocked and ready to fire. A detent spring **195** pivots the detent **189** upwardly out of engagement with the trigger. Referring to FIG. **33**, the detent is allowed to move upwardly when the slide is in the forward position by openings **90** in the bottom walls **58** of the slide **50**. Upwardly extending arms **189***a* on the detent are pushed upwardly into the openings by the detent spring **195**.

After the gun is fired, the slide **50** is prevented from moving rearwardly by the detent arms **189***a*. The slide is released by pushing the outwardly extending arms **196***a* (FIG. **33**) of the detent lever **196** downwardly, which moves the detent to its FIG. **30** position and allows the slide to move to its FIG. **30** position.

FIGS. **35–39** illustrate another embodiment of a spring air gun **210**. The gun **210** is similar to the guns **10** and **135** except for the detent and detent lever.

A detent **289** is shown in its lower position in FIG. **35**. The slide **50** is released, and the detent engages the trigger **104** and prevents the trigger from being pulled.

In FIG. **36**, the slide **50** is pulled to the right, and the sear **74** has rotated into engagement with the piston **28**. A detent lever **296** is pivotally mounted in the frame below the detent **289** and is biased to rotate counter clockwise against the detent by a spring **295**. However, the detent is prevented from moving upwardly by the bottom walls **58** of the slide. The detent includes a pair of upwardly extending arms **289***a* (see also FIG. **38**) which abut the bottom walls.

In FIG. **37** the slide **50** has been pushed to its forward position, and the gun is cocked and ready to fire. The detent **289** is allowed to pivot upwardly under the force of the detent lever **296** when the openings **90** in the bottom walls **58** of the slide are aligned with the arms **289***a* of the detent. The detent lever engages a curved lower camming surface **291** on the detent.

The detent **289** is prevented from moving downwardly when the gun is cocked and ready to fire by the detent lever **296**, which is below the detent.

When the trigger is pulled to fire the gun, a rearwardly extending projection **221** on the trigger engages the detent lever **296** and rotates the lever clockwise. The detent **289** can then be pushed downwardly to release the slide **50**. Referring to FIG. **37**, the detent includes laterally outwardly extending arms **292** which extend through openings in the frame. The gun can therefore be operated by both right handed and left handed persons.

While in the foregoing specification a detailed description of specific embodiments of the invention was set forth for the purpose of illustration, it will be understood that many of the details herein given can be varied considerably by those skilled in the art without departing from the spirit and scope of the invention.

We claim:

1. A spring air gun comprising:

a frame having front and rear portions,

a barrel mounted on the front portion of the frame,

a compression cylinder mounted on the frame and communicating with the barrel,

a piston slidably mounted in the compression cylinder for movement between a cocked position and a fired position,

a sear mounted on the frame for movement between a cocked position in which the sear maintains the piston in the cocked position and a fired position in which the sear allows the piston to move to the fired position,

a trigger movably mounted on the frame for movement between an unfired position and a fired position,

a first spring engaging the piston for urging the piston toward the fired position,

a slide slidably mounted on the frame for movement between forward and rearward positions,

means connecting the slide and the piston for moving the piston from the fired position to the cocked position when the slide moves from the forward position to the rearward position,

a second spring engaging the piston for urging the slide toward the rearward position,

a detent movably mounted on the frame between first and second positions, the detent being engageable with the slide when the detent is in the first position and the slide is in the forward position to prevent the slide from moving rearwardly, the detent being maintained in the second position by the slide when the slide is in the rearward position, the detent preventing the trigger from moving to the fired position when the detent is in the second position.

2. The gun of claim **1** in which the detent is movable in a direction which extends generally perpendicularly to the direction of sliding movement of the slide and includes a first portion which is engageable with the slide and a second portion which is engageable with the trigger when the detent is in the second position.

3. The gun of claim **2** in which the detent is mounted in the frame for pivoting movement, and a detent lever which is formed separately from the detent and which is mounted in the frame for pivoting movement for moving the detent from the second position to the first position when the slide is in the forward position.

4. The gun of claim **3** in which a portion of the detent extends outwardly from the frame whereby the detent can be moved from its first position to its second position when the piston is in the fired position and the slide is in the forward position.

5. The gun of claim **3** in which the trigger includes a projection which is engageable with the detent lever for pivoting the detent lever away from the detent when the trigger moves to the fired position.

6. The gun of claim **1** in which the trigger includes a finger portion and a shoulder, the shoulder being engageable with the detent when the detent is in the second position.

7. The gun of claim **1** in which the slide includes a bottom wall which is provided with a detent opening, the detent extending into the detent opening when the slide is in the forward position.

8. The gun of claim **1** including a detent lever which extends through an opening in the frame for moving the detent from the first position to the second position.

9. The gun of claim **8** in which the detent lever is formed separately from the detent and is movably mounted in the frame.

10. The gun of claim **8** in which the detent lever is engageable with the sear when the sear is in the cocked

position whereby the sear prevents the detent lever from moving the detent to the second position.

11. The gun of claim **10** in which the detent lever is formed separately from the detent and is movably mounted in the frame for movement between a first position in which the detent lever does not engage the detent and a second position in which the detent lever maintains the detent in the second position whereby the detent lever can be moved to its first position by the sear when the sear moves to its cocked position while the slide is in the rearward position.

12. The gun of claim **11** in which the sear includes a first shoulder which engages the piston when the piston and the sear are in the cocked positions and a second shoulder which is engageable with the detent lever when the sear is in the cocked position.

13. The gun of claim **11** in which the detent and the detent lever are mounted in the frame for pivoting movement.

14. The gun of claim **1** in which the trigger includes a finger portion and a trigger extension which extends rearwardly from the finger portion, release means movably mounted on the frame for movement between a cocked position for maintaining the sear in the cocked position and a fired position for allowing the sear to move to the fired position, the trigger extension being engageable with the release means as the trigger moves from the unfired position to the fired position for moving the release means to the fired position.

15. The gun of claim **14** in which the slide includes a bottom wall which is provided with a detent opening, the detent extending into the detent opening when the slide is in the forward position.

16. The gun of claim **15** including a detent lever which extends through an opening in the frame for moving the detent from the first position to the second position.

17. The gun of claim **16** in which the detent lever is formed separately from the detent and is movably mounted in the frame.

18. The gun of claim **17** in which the detent lever is engageable with the sear when the sear is in the cocked position whereby the sear prevents the detent lever from moving the detent to the second position.

19. The gun of claim **18** in which the detent lever is formed separately from the detent and is movably mounted in the frame for movement between a first position in which the detent lever does not engage the detent and a second position in which the detent lever maintains the detent in the second position whereby the detent lever can be moved to its first position by the sear when the sear moves to its cocked position while the slide is in the rearward position.

20. A spring air gun comprising:

a frame having front and rear portions,

a barrel mounted on the front portion of the frame,

a compression cylinder mounted on the frame and communicating with the barrel,

a piston slidably mounted in the compression cylinder for movement between a cocked position and a fired position,

a sear mounted on the frame for movement between a cocked position in which the sear maintains the piston in the cocked position and a fired position in which the sear allows the piston to move to the fired position,

means for moving the sear from the cocked position to the fired position whereby the piston is allowed to move to the fired position,

a piston tube extending rearwardly from the piston,

a piston rod slidably mounted in the piston tube and extending rearwardly therefrom,

a spring sleeve surrounding the piston rod and having a rear wall, a rear end portion of the piston rod extending through an opening in the rear wall of the spring sleeve,

an inner spring surrounding the piston tube and the piston rod and being positioned inside of the spring sleeve, the inner spring having a front end engaging the piston and a rear end engaging the rear wall of the spring sleeve,

means for preventing rearward movement of the spring sleeve relative to the piston rod,

an outer spring surrounding the inner spring and the spring sleeve and having a front end engaging the piston and a rear end,

a bushing on the rear end portion of the piston rod, the bushing including forwardly extending projections which engage the rear end of the outer spring and maintain the rear end of the outer spring forwardly of the end wall of the spring sleeve, and

means removably mounted on the rear end portion of the piston rod for preventing rearward movement of the bushing relative to the piston rod.

21. The gun of claim **20** in which the means for preventing rearward movement of the spring sleeve comprises a locking ring mounted on the piston rod.

22. The gun of claim **20** in which the means for preventing rearward movement of the bushing comprises a pair of prongs which are inserted into a groove on the end portion of the piston rod.

23. The gun of claim **20** in which the means for preventing rearward movement of the bushing comprises a tool which includes a handle and a pair of prongs which extend from the handle and which are inserted into a groove on the end portion of the piston rod.

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